U.S. DEPARTMENT OF THE INTERIOR

ENVIRONMENTAL ASSESSMENT

BACK BAY NATIONAL WILDLIFE REFUGE
FIRE MANAGEMENT PROGRAM

U.S. Fish and Wildlife Service
Back Bay National Wildlife Refuge

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BACK BAY NATIONAL WILDLIFE REFUGE

WILDLAND FIRE MANAGEMENT PLAN

ENVIRONMENTAL ASSESSMENT

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I. PURPOSE AND NEED

The role fire plays in the National Wildlife Refuge System is key to the conservation, management and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations. The U.S. Fish and Wildlife Service has long recognized fire as a unique ecological process that shapes wildlife habitat structure and function, and has managed and used this process to further its mission.

There is a continuing need at the Back Bay National Wildlife Refuge (Back Bay NWR) to better manage fire, and provide for the protection of life, property, and resources, while perpetuating natural processes. The Fire Management Plan (FMP) for Back Bay NWR has been developed to provide direction and continuity in establishing operational procedures to guide all fire management activities. The FMP for Back bay NWR will assist in achieving resource management objectives as defined in several of the refuge's operational plans.

U.S. Department of the Interior policy states that refuge lands with vegetation capable of sustaining fire will develop a fire management plan (910 DM 1.4B). The Fish and Wildlife Service's Fire Management Handbook (621 FW 1.4-6) states that ". . . all Refuges with vegetation that can sustain fire must have a Fire Management Plan."

The fire management program at Back Bay NWR will be carefully guided by resource management objectives designed to offer the greatest protection and perpetuation of this Refuge's natural resources and associated natural processes. Back Bay NWR has been operating under an old FMP that was approved in November 1985. Numerous changes involving land acquisition, habitat management practices and habitat conditions have occurred since then, that need to be incorporated into a new Plan. Those revisions have been incorporated into the new Back Bay FMP submitted for Regional Fire Management Officer review in January 2002.

This Environmental Assessment for the 2002 revision of the Back Bay NWR FMP, explores the various methods in which Service policy can be carried out, consistent with agency direction, and analyzes the foreseeable impacts associated with an integrated fire management program.

II. DEFINITIONS

The following definitions are used throughout this document:

Wildland Fire Suppression - All work involved with extinguishing or confining a fire, beginning with its discovery.

Prescribed Fire - Fire applied in a scientific way to fuels on a specific land area under selected weather conditions to accomplish predetermined, well-defined management objectives, and identified in an approved Prescribed Fire Plan.

Urban Interface - The geographic locale at which human residences or structures abut or adjoin wildlands. Wildlands include forested, shrub-scrub or wetlands habitats. Also referred to as the "wildlands-urban interface."

III. ALTERNATIVES

A. ALTERNATIVE 1 - WILDLAND FIRE SUPPRESSION ONLY

Under this alternative all ignitions throughout the Refuge, including those of both natural and human caused origin, would be suppressed and no management prescribed fires would be conducted. Hazard fuel reduction would be accomplished by mechanical methods to the extent practical and consistent with land management objectives. Mechanical manipulation would be limited to non-resource sensitive areas, Refuge boundary protection and adjacent urban interfaces (ie. community of Sandbridge, etc.). However, mechanical manipulation would not be permitted in those parts of the Refuge that have been nominated for Wilderness status; or which become Wilderness in the future. No natural ignitions or human-caused wildfires would be allowed to burn without suppression, including fires on nominated or existing Wilderness areas. However, suppression actions on such nominated or existing Wilderness lands will conform to current federal Wilderness management policies.

B. ALTERNATIVE 2 - PRESCRIBED FIRE AND WILDLAND FIRE SUPPRESSION - THE PROPOSED ACTION

Under this alternative, fire hazards adjacent to Refuge urban interfaces and refuge boundaries would be reduced. Suppression would be undertaken on fires that threaten life, property, or resources; or that exceed prescription limits. Hazard fuel reduction along

urban interfaces adjacent to the Refuge will be accomplished by mechanical and chemical methods. Prescribed fires would also be permitted under this alternative. Prescribed burning would take place during the spring (April-May), late summer (August) and/or fall (September-October),. On Back Bay NWR, prescribed fire would be used as a tool to achieve specific resource management objectives. These objectives include: reducing fuel build-up hazards; simulating natural fire processes that enhance wildlife and plant species populations; preserving endangered and threatened species habitats; promoting biological diversity; controlling invasive species; promoting native vegetation; and providing higher quality habitat for waterbirds (waterfowl, wading birds, shorebirds and marshbirds). Prescribed fire would also be used in selected Refuge uplands to maintain Refuge grasslands and old-fields as declining songbird species' breeding habitats. Prescribed fire could also serve as a research tool to determine the effects of fire on plant and avian communities in Refuge habitats. All prescribed fires would be monitored closely and implemented with the specific number of personnel and equipment necessary to execute these actions

Naturally-ignited or human-caused wildland fires that occur in wet marsh areas of the North Bay Marshes, western Back Bay marshes, and Back Bay interior islands, and that do not threaten life, property and significant wildlife resources, will receive the least aggressive suppression action. These wetlands are not accessible to ground fire-fighting equipment, and have an extensive fire history. Fires in these areas will burn out at natural fire breaks (usually waterways), and will be monitored by fire personnel. Some of these wetlands are currently nominated for Wilderness status, and are expected to achieve that status soon. As a result, fire management in those areas would be regulated by existing Wilderness management policies. However, suppression actions on such nominated or existing Wilderness lands will conform to current federal Wilderness management policies.

C. DISMISSED ALTERNATIVE

A no-action alternative of allowing all fires to burn at all times was initially considered, but eventually dismissed, as not suitable for further consideration in the development of this proposal. This "No Action Alternative" was rejected because it fails to meet U.S. Fish and Wildlife Service policy in regards to potential liability for loss of life and property, as well as unacceptable negative impacts to environmental, social, and economic values.

IV. AFFECTED ENVIRONMENT

A. LOCATION AND HISTORY

Back Bay National Wildlife Refuge was established by Executive Order #7907 on June 6, 1938. Prior to acquisition by the Federal government, the barrier beach portion was generally flat and sandy. The saline soils were unproductive. Periodic "northeasters" and hurricanes pushed large quantities of sea water across these flat beaches, and into Back Bay. During the early 1930's the Civilian Conservation Corps built brush fences and planted cane and bulrush to catch moving sands; thus building and stabilizing new sand dune formations. Later, wooden sand fences were constructed, and many dunes were planted with Beachgrass (*Ammophila breviligulata*). These new dunes protected the bayside flats and permitted formation of a brackish marsh. Hunting and fishing were the principal land uses then. Waterfowl hunting clubs were numerous, with the Ragged Island and Princess Anne Clubs comprising most of the land that became Refuge then.

Back Bay NWR is located entirely within the City of Virginia Beach, in southeastern Virginia, and encompasses the northern two-thirds of the Back Bay ecosystem. The Refuge currently totals approximately 8,600 acres, of which 4,600 acres are open water and marsh islands within Back Bay. The barrier beach portion extends 4.2 miles along the Atlantic Ocean shoreline, and is bordered on the north by Little Island City Recreational Park and on the south by False Cape State Park. The Refuge's southeastern boundary is approximately 4.5 miles from the North Carolina border. The Refuge headquarters and 880 acre impoundment complex are located on the barrier island portion, south of the Town of Sandbridge. Figure #1 shows the Refuge general vicinity and its boundary. Specific information not provided, relating to history, are provided on page 3 of the Refuge umbrella document, The Station Management Plan (Leger. 1993).

B. PHYSICAL RESOURCES

Additional information not provided below about Physical Resources, are provided on page 3 of the Refuge umbrella document, The Station Management Plan (Leger. 1993).

1. Climate

The climate of Virginia Beach is modified continental with mild winters and hot, humid summers. The average temperature in winter is 42 degrees F., while the average daily minimum temperature is 33 degrees F. In summer, the average temperature is 77 degrees F., while the average daily maximum temperature is 85 degrees F. Annual precipitation averages 45 inches. Of this total, 25 inches, or 56%, usually falls during April through September. The growing season is 237 frost-free days; the longest growing season in

Virginia. The average seasonal snowfall is 7.2"; although the average snowfall for the past ten years is less than that. The average relative humidity in mid-afternoon is approximately 58%. Humidity is higher at night; the average at dawn is approximately 78%.

The prevailing wind is from the southwest; although winter winds tend to be northerly, and summer winds more southerly. The average wind-speed is highest in March, at about 10.6 miles per hour. This area is subject to storm events out of the northeast during fall, winter and spring. These events may be accompanied by severe thunderstorms, heavy rains, and strong winds, that cause local flooding. Although Virginia Beach is north of the track usually followed by hurricanes and tropical storms, the City has been infrequently struck by hurricanes.

2. Topography

The flatness of lands around Back Bay is the central topographic feature of the Back Bay watershed. Pungo Ridge runs in a north-south direction along the western side of Back Bay. It provides the highest land elevations of 15'-20' above mean sea level (msl) at several points. Princess Anne Road follows Pungo Ridge. Along the eastern side of Back Bay, the sand dunes of the Refuge and False Cape State Park present a second high elevation line. Back Bay NWR's lower dunes reach 20'-25'; while those of False Cape State Park range from 40'-50', and 64' at the highest location.

Between the parallel ridges on the Pungo side lie the better drained uplands. They fall away from the highest elevations to an imaginary line at about 5' msl. This lower elevation is the upper edge of the flood-plain; where the marshes and swamps of Back Bay's ecotones are located. Crops are farmed in this area, along the slightly higher elevations where the soils dry out more readily. Because of the flatness of the topography and the low elevations, flooding from wind-tides is a frequent problem for local farmers, particularly below the 4' contour elevation.

3. Soils

The Soil Conservation Service has mapped the soils within the City of Virginia Beach (USDA.1985). The major associations found within the Refuge include poorly drained Acredale-Tomotley-Nimmo (marine/fluvial loams), Back Bay-Nawney (fluvial organics) and Newhan-Duckston-Corolla (marine/eolian sands) soils.

C. BIOLOGICAL RESOURCES

1. Vegetation and Fuels

More specific information on specific habitat types and their species compositions can be

found in Section IV.D. of the Back Bay NWR Fire Management Plan (FMP) (FWS 2002). The descriptions in the following section will be more general, as presented in the Back Bay NWR Station Management Plan (Leger. 1993.) and consolidate habitat and species composition information in the FMP.

a. Beach/Dune Grasslands:
Between the Atlantic Ocean and the sand dunes are found very few plants. The few that do exist there occur between the wrack line and the toe of the dunes. These pioneer species include Sea rocket (*Cakile edentula*) and American beach grass (*Ammophila breviligulata*). The higher dune lines are colonized by grasses, principally Beach grass and Sea oats (*Uniola paniculata*), that are adapted to salt spray, overwashes, sand-blasting and drought. In more sheltered, stabilized areas of the dunes, sea rocket, evening primrose (*Oenothera humifusa*), Seaside goldenrod (*Solidago sempervirens*), Beach pea (*Strophostyles helvola*), Sandspur (*Cenchrus tribuloides*), Daisy fleabane (*Erigeron canadensis*) and spurge (*Euphorbia polygonifolia*) can be found. Prescribed fire is not a management option within this habitat type.

The most stabilized, wetter, interdunal swales support the highest diversity of plant species. During surveys, 129 plant species have been identified in these areas. Dominant species include Saltmeadow cordgrass (*Spartina patens*), rushes (*Juncus* spp.), Black needlerush (*Juncus roemerianus*), Common three-square (*Scirpus americanus*), Broom-sedge (*Andropogon virginicus*), Pennywort (*Hydrocotyle umbellata*), Centella (*Centella asiatica*), spikerushes (*Eleocharis* spp.) and Water purslane (*Ludwigia palustris*). Woody vegetation along the perimeters include Groundsel (*Baccharis halimifolia*), Waxmyrtle (*Myrica cerifera*), Bayberry (*Myrica pennsylvanica*), Live oak (*Quercus virginiana*) and Black cherry *(Prunus serotina*). Prescribed fire is not a management option within this habitat type.

b. Maritime Shrub-scrub & Forest:
On the barrier island portion of the Refuge, a shrub-scrub thicket exists in the ecotonal strip between the sand dunes and emergent marshes, or Maritime forest. Where salt spray is present, "salt pruning" of the upper branches occurs. Dominant shrubs of this dense thicket community include, Waxmyrtle, High-bush blueberry (*Vaccinium corymbosum*), Live oak, American holly (*Ilex opaca*), Yaupon (*Ilex vomitoria*), Red cedar (*Juniperus virginiana*), Groundsel and Hudsonia (*Hudsonia tomentosa*). Woody vines include, Virginia creeper (*Parthenocissus quinquefolia*), grapes (*Vitis* spp.), greenbriers (*Smilax* spp.) and Poison ivy (*Rhus radicans*). Ground cover is sparse, and consists mostly of seedlings of the above-mentioned plants. Prescribed fire is not considered to be a good management tool for managing these Shrub-scrub habitats,

since Shrub-scrub is normally the climax habitat for this particular niche (between the sand dunes and emergent marshes). No benefits will be realized by modifying it; since fire would destroy much of the vegetation therein, and reduce its high songbird use value. This habitat is best left as is, and protected from wildfire.

Shrub-scrub thickets merge into maritime forest in some areas. Such a remnant maritime forest exists along the "Green Hills" area, along the southwestern side of the impoundment complex, and adjacent to False Cape State Park's much more extensive Maritime forest. These forested areas are generally not higher than 20', with dense lateral branching caused by salt-pruning of apical growth. Dominant species include Live oak, Loblolly pine (*Pinus taeda*), red cedar and Laurel oak (*Quercus laurifolia*). Understory species include American holly, Black cherry, Poison ivy, Greenbriers, Virginia creeper and grape.

Management of Maritime forest habitats should consist of mechanical removal of some less desirable Loblolly pine, Sweetgum and Red maple; and planting of more desirable Pond pine (*Pinus serotina*), oaks and tupelos/gums (*Nyssa sylvatica* and *N. aquatica*). Once these species are established, periodic prescribed fire should be used to maintain them.

c. Fresh to Brackish Emergent Marshes:
Slightly brackish to fresh-water marshes cover most of the low-lying areas of the Refuge barrier beach, the islands within Back Bay, and the northern and western portions of the Refuge. This includes the 880 acre, ten-impoundment complex, that spans three of the four miles of Refuge barrier island.

The man-made impoundment complex is dominated by: Narrow-leaved cattail (*Typha angustifolia*), Black needlerush (*Juncus roemerianus*), Saltmarsh bulrush (*Scirpus robustus*), Soft-stem bulrush (*S. validus*), Water hyssops (*Bacopa* spp.), Spikerushes (*Eleocharis* spp.), wild millets (*Echinochloa Walteri* and *E. crusgalli*), Saltmeadow cordgrass, Beggar-ticks (*Bidens* spp.), Common three-square, and the invasive pest Common reed (*Phragmites communis/australis*). Woody plants occupy several higher elevation, sandy mounds in all impoundments. These woody plants include: Live oak, Waxmyrtle, Loblolly pine, Red maple (*Acer rubrum*) and Greenbriers. Live oaks are protected because of their critical mast production role on the barrier island. Their acorns are used as food by most mammal residents, as well as several waterfowl species. Prescribed fire is, and should continue to be, part of the impoundment management program. Its goal is to reduce the coverage and densities of such undesirable perennials as Phragmites reed (dead) and Black needlerush stands, as well as Saltmeadow hay.

Most natural emergent marshes of the Refuge are less diverse than the impoundment complex. They principally consist of Black needlerush, with a scattering of Narrow-leaved cattail, Saltmeadow hay, arrowheads (*Sagittaria* spp.), Rose-mallow (*Hibiscus palustris*), Seashore mallow (*Kosteletzkya virginica*), Dotted smartweed (*Polygonum punctatum*) and the invasive pest Common reed. Common reed has rapidly expanded throughout these natural emergent marsh habitats during the past 30 years; resulting in a serious net loss of natural marsh habitat quality and quantity. Areas receiving freshwater runoff are often dominated by cattails. More interior emergent marshes on Long Island and in the North Bay Marshes support unique Olney's threesquare (*Scirpus olneyi*) marshes that are not common in the Back Bay watershed. Management of natural emergent marshes will include prescribed fire. Prescribed fire objectives include fuel reduction (both live and dead Black needlerush, and dead Phragmites reed stands), and improved feeding access to migrating and wintering waterfowl.

Adjacent open-water areas of the Refuge harbor scattered patches of submerged aquatic vegetation (SAV). Milfoils (*Myriophyllum* spp.), Sago pondweed (*Potamogeton pectinatus*) and Widgeongrass (*Ruppia maritima*) are most common; with more localized patches of Wild celery (*Valisneria americana*), Coontail (*Ceratophyllum demersum*), Najas (*Najas guadalupensis*), Muskgrass (*Chara* spp.) and other pondweeds (*Potamogeton* spp.).

d. Forested Swamps:
These habitats are principally located in the low-elevation, marsh-forest ecotone, that forms a strip along Back Bay and Black Gut; as well as Ashville Bridge, Nawney, Beggar's Bridge, Muddy and Hell Point Creeks' shorelines, and east of Muddy Creek Road. Dominant overstory plant species include red maple, bald cypress (*Taxodium distichum*), sweetgum (*Liquidambar styraciflua*), black gum/tupelo (*Nyssa sylvatica*) and black willow. Understory species include waxmyrtle, inkberry (*Ilex glabra*), shrubs, false nettle (*Boehmeria cylindrica*), marsh fern, royal fern (*Osmunda regalis*), sensitive fern (*Onoclea sensibilis*), greenbriers, poison ivy and immature canopy species. Current management plans for this habitat type are limited to pest control of Phragmites reed. Prescribed fire is not likely because of the high soil/fuel moistures and a lack of ground cover.

e. Bottomland/Lowland Forests:
The largest area of this forest habitat occurs around the Black Gut vicinity, and north of Sandbridge Road. Smaller stands also occur to the south of Sandbridge Road, east of Muddy Creek Road and around Colechester Road. This habitat type abuts cooperatively-farmed Refuge lands, privately-owned agricultural lands, small businesses and scattered single-family homes. Those forests are typically not suitable

for agriculture because of their wetness. Overstory species include loblolly pine, red maple, sweetgum, laurel oak (*Quercus laurifolia*), white oak (*Quercus alba*), tulip tree (*Liriodendron tulipifera*), southern magnolia (*Magnolia grandiflora*), hickories (*Carya* spp.), American basswood (*Tilia americana*), Black tupelo, and black cherry. Understory species include flowering dogwood (*Cornus florida*), waxmyrtle, highbush blueberry, Virginia creeper, greenbriers, poison ivy, honeysuckles (*Lonicera* spp.), and immature canopy species.

Management within these habitat types will most likely involve mechanical clearing of less desirable Loblolly pine, red maple and Sweetgum trees and replanting of more desirable species (oaks, Bald cypress, tupelos/gums, etc.). Prescribed burning will not be used, due to the absence of ground cover and because the high soil/fuel moistures will not normally support a prescribed fire.

f. Agricultural and Old Fields:
Marshes and forested swamp habitats gradually grade upwards into low-lying, poorly drained, old fields within the post 1990 land acquisitions. Most of these lands were crop-farmed prior to Refuge acquisition. In some cases farming has continued through a Refuge Cooperative Farming Program. These fields generally maintain elevations below 5' msl.

Fields that are no longer farmed now support dense groundsel-tree, waxmyrtle, loblolly pine, young Red maple and Sweetgum; mixed perennial grasses including Wooly beardgrass (*Erianthus giganteus*) and Panic grasses (*Panicum* spp.); plus a variety of sedges (*Carex* spp.), rushes (*Juncus* spp.) and Blackberry (*Rubus allegheniensis*). Songbird management is being carried out on these tracts to encourage use by such species as the Field sparrow, Indigo bunting, Blue grosbeak, and a variety of warblers. Prescribed burning of these old fields may be an effective management tool, if sufficient ground cover exists to carry the fire.

Some fields continue being farmed to agricultural and wildlife crops by a local, cooperative farmer. These fields exist along the northern and western borders of Back Bay NWR (adjacent to Sandbridge, Colechester and Muddy Creek Roads). Crops being grown on those lands include corn, wheat, soybeans, wild bird seed and natural moist soil plants. In many cases these fields are adjacent to private, single family residences. Most of this currently farmed land exists adjacent to Sandbridge, Colechester and Muddy Creek Roads. Some recently cooperative- farmed fields have been, or are in the process of being, converted to wetlands via joint venture wetlands restoration projects.

One 45 acre field south of Sandbridge Road that had been farmed to a clover wildfowl crop in the past, is in the process of being converted to a Grasslands Bird use area. This field consists of grasses and forbs. Dominant grasses include: Crabgrass (*Digitaria* spp.), scattered Switchgrass (*Panicum virgatum*) and the invasive pest Japanese stiltgrass (*Microstegium vimineum*). Dominant forbs include: Fennel (*Foeniculum vulgare*), goldenrod (*Solidago* spp.) and aster (*Aster* spp.). Current plans call for keeping this field in a grasslands state, via seed- drilling Little bluestem grass and a sustained prescribed burning program (to reduce competing grass species). The invasive Japanese stiltgrass must also be reduced or eliminated.

2. Wildlife

Although the Back Bay area has been noted for its historically large wintering waterfowl populations and accompanying sport fishery, it also supports a wide diversity of other wildlife.

a. Threatened and Endangered Species:

Back Bay NWR has had an active Bald eagle (*Haliaeetus leucocephalus*) nest in the woodlands edge adjacent to the northwestern "North Bay Marshes" area of the Refuge, since late 1992. Since then, this nest has consistently fledged from one to three young annually.

During the spring and fall raptor migrations, Peregrine falcons (*Falco peregrinus*) often use the beach-front and impoundment complex, on the barrier island portion of the Refuge.

During the spring and fall shorebird migrations, Piping plovers (*Charadrius melodius*) are occasionally seen foraging along the water line of the Refuge beach-front. However, no nesting has occurred, to date.

Sea turtles use the Atlantic Ocean, adjacent to the Refuge beach-front, from late May through September, as they migrate to and from nearby Chesapeake Bay. The Loggerhead sea turtle (*Caretta caretta*) deposits an average of 2-3 nests on the Refuge beach during June through August of each year. Stranded sea turtles also wash up from May through October. Nearly all are dead. Past strandings have included mostly Loggerheads; however, occasional strandings have also included Leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempi*), Green (*Chelonia mydas*) and Hawksbill (*Eretmochelys imbricata*) sea turtles -- some alive.

Virginia State listed species (from Virginia Department of Game & Inland Fisheries list) occurring on the Refuge include the following:

- Plants - Epiphytic sedge (*Carex decomposita*), Endangered. Found in flooded woodlands, near the base of such trees as Bald cypress.
  - Carolina liliaeopsis (*Liliaeopsis carolinensis*), Threatened. Found in swales and emergent marshes with standing water, around Back Bay.
- Birds - Gull-billed tern (*Sterna nilotica*), Threatened. Found along ocean-front beaches during migration.
  - Upland sandpiper (*Bartramia longicauda*), Threatened. Found in upland, grasslands/fields.
- Reptiles & Amphibians - Eastern glass lizard (*Ophisaurus ventralis*), Threatened. Wet sandy, muddy areas along barrier island; past sightings in Refuge headquarters vicinity, along entrance road.
- Mammals - Water shrew (*Sorex palustris*), Endangered.
  - Eastern big-eared bat (*Plecotus rafinesquii macrotis*), Endangered.
- Invertebrates - Duke's skipper (*Euphyes dukesi*), Threatened. Found in forested black gum/tupelo-cypress swamps.

Other State listed Rare, or "Species of Special Concern,"include the following.
Birds: Yellow-crowned night heron (*Nycticorax violaceus*), King rail (*Rallus elegans*), and Least bittern (*Ixobrychus exilis*) - all emergent marsh dwellers.
Plants: Long beach seedbox (*Ludwigia brevipes*), Winged seedbox (*L. Alata*), and Viviparous spikerush (*Eleocharis vivipara*). All three are found in low-elevation, "greener,"depressions within Refuge wetlands along the northern and western sides of Back Bay.
Reptiles & Amphibians: Carpenter frog (*Rana virgatipes*),
Invertebrates: Stripe-winged baskettail (*Epitheca costalis*), a damselfly (*Enallagma durum*), and the Saffron skipper (*Poanes aaroni aaroni*). All three insects are found in the Black Gut Natural Area marshes, north of Sandbridge Road. A Tiger beetle (*Cicindela trifasciata*) was found in the year 2000 in the sand dunes east of the B/C Cross-dike.
Mammals: Marsh rabbit (*Sylvaligus palustris*) - observed in vicinity of Refuge Maintenance Compound on barrier island area. Cotton mouse (*Peromyscus gossypinus*) - wet fields around Back Bay.

The refuge also contains six State Natural Areas. These areas were identified by the Virginia Department of Conservation & Recreation's Division of Natural Heritage in "*A Natural Areas Inventory of the City of Virginia Beach, Virginia*" (Clampitt et al. 1993). These areas consist of "'the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest' (Virginia Natural Area Preserves Act, S10.1-209 et seq. Of the Code of Virginia)." These six areas are:

1. Black Gut Natural Area
2. Muddy Creek Natural Area
3. Nawney Creek Natural Area
4. North Bay Marshes Natural Area
5. Porpoise Point Natural Area
6. Wash Flats Natural Area

Four natural communities of biological significance are identified in the inventory:
1. Cattail-Tall spikerush freshwater marsh
2. Short spikerush freshwater marsh
3. Three-square bulrush - Cattail Oligohaline marsh
4. Coastal interdunal swales

The FMP will be implemented consistent with provisions provided in the Endangered Species Act of 1973, as amended, and will take appropriate action to identify and protect from adverse effects any rare, threatened, or endangered species. U.S. Fish and Wildlife Service policy requires measures to minimize impacts upon federal and state threatened and endangered species and federal candidate species are considered in all planning activities.

Protecting the Back Bay watershed and other sensitive natural communities on the Refuge from activities that could degrade water quality (erosion, siltation, nutrient-loading, etc.) is a high priority in managing the fire program at Back Bay NWR. All of the rare habitats listed by the State of Virginia are wetland or aquatic habitats (marsh, swamp, creek, etc.). All of the state endangered or threatened species plants identified in Appendix A are found in wetlands habitats (such as moist-soil units within the eastern sides of Refuge impoundments) with low, non-robust vegetation. Therefore, these plants are not likely to be affected by prescribed burn activities carried out at Back Bay NWR. Prescribed burns at Back Bay NWR will focus on robust perennial species such as Black needlerush, waxmyrtle and Phragmites reed; on upland field and forest/woods habitats; as well as within diked impoundments. Fire suppression activities should be minimized up-slope of all moist-soil wetlands and similar aquatic habitats.

b. Migratory Birds:
The Refuge is part of the eastern portion of the Atlantic Flyway. Refuge wetlands are extensively used by waterfowl during the winter, as well as the spring and fall migrations. Although waterfowl production is not significant, Back Bay NWR provides feeding and resting habitats for thousands of waterbirds during the winter, and during their migrations. Heavy waterbird use occurs within the wetlands of the 880 acre

impoundment complex, Ragged Island and southwestern Long Island.

Over 300 species of birds regularly occur on the Refuge; they include 32 warblers, 29 waterfowl, 30 shorebird, and 13 wading bird, species. Ninety-five bird species nest on Back Bay NWR. The Refuge also manages several upland fields in the Sandbridge Road vicinity for several declining Landbird and Grasslands bird species.

c. Mammals:
Some 47 species of indigenous mammals are present on the Refuge. The most commonly seen are the white-tailed deer (*Odocoileus virginianus*), Red fox (*Vulpes fulva*), Marsh rabbit (*Sylvaligus palustris*) and nutria (*Myocastor coypus*). Non-indigenous feral horses and hogs continue to use the barrier island portion of the Refuge on a regular basis.

d. Fish:
At one time, the fishery in Back Bay and Currituck Sound was called "one of the best in the country," particularly for largemouth bass (*Micropterus salmoides*). Today, however, bass fishing has been severely limited, due to the decline of submerged aquatic vegetation (SAVs) in Back Bay. National wildlife refuges in the Roanoke-Tar-Neuse-Cape Fear Ecosystem are working together on a new effort aimed at better managing the SAVs of those watersheds.

Other important sport fish in Back Bay include the Black crappie (*Pomoxis nigromaculatus*), chain pickerel (*Esox niger*), Bluegill/Bream (*Lepomis macrochiris*), White perch (*Morone americana*) and Pumpkinseed (*Lepomis gibbosus*). Along the ocean-front, surf and commercial fishermen regularly catch the Croaker (*Micropogonias undulatus*), Weakfish/Sea trout (*Cynoscion nebulosus*), Spot (*Leiostomus xanthurus*), Striped bass (*Morone saxatilis*), Bluefish (*Pomatomus saltatrix*) and flounder (*Paralichthys dentatus*).

e. Reptiles and Amphibians:
Rare amphibian and reptile species known to use Back Bay Refuge include the Eastern glass lizard (*Ophisaurus ventralis*), Eastern hellbender (*Cryptobranchus alleghaniensis alleghaniensis*) and Loggerhead sea turtle (*Caretta caretta*). The Canebrake rattlesnake (*Crotala horridus atricaudatus*) was historically found in the western side of Back Bay, but is not believed to be currently present. Both the Eastern cottonmouth (*Agkistrodon piscivorus piscivorus*) and Southern copperhead (*Agkistrodon contortrix contortrix*) venomous snakes exist on the Refuge. The Cottonmouth is principally found in wetlands throughout Back Bay and its tributaries; while the Copperhead is found in woodlands along western Back Bay.

Common amphibians include the Spring peeper (*Hyla cricifer*), Bull (*Rana catesbeiana*), Green tree (*Rana clamitans*), Green (*Hyla cinerea*), Squirrel tree (*Hyla squirrella*), Southern cricket (*Acris gryllus gryllus*), Brimley's Chorus (*Pseudacris brimleyi*), Cope's gray tree (*Hyla chrysoscelis*), and Southern leopard (*Rana utricularia*) frogs; and the Southern (*Bufo terrestris*), Fowler's (*Bufo woodhousei fowleri*) and Eastern narrow-mouthed (*Gastrophryne carolinensis*) toads. Other unusual reptile residents include the Yellow-bellied slider (, Red-bellied slider, and Mud turtles; and the Northern water, Brown water, Rough green, Smooth green, and Rainbow snakes.

f. Invertebrates:
A variety of benthic invertebrates occupy Refuge wetlands habitats. These include numerous insect larvae (esp. *Chironomidae*), crustacea (*Copepoda, Isopoda, Amphipoda, Decapoda,* etc.), gastropods (snails), shellfish (clams), and annelids (worms). These invertebrates are important links in the food chains of many Back Bay waterbirds, fish and amphibians.

D. CULTURAL RESOURCES

Habitats surrounding the Refuge are largely natural/rural; but do vary in places from agricultural, to residential housing, to small businesses. Non-Refuge lands along the western side of Back Bay are principally made up of farmlands. Agriculture and federal subsidies contribute significantly to the local economy, despite the low prices paid to farmers for their corn, soybean and melon crops. Lands adjacent to the Refuge in the northern portions of the Refuge consist of scattered, single-family residences and several small businesses. Eastern barrier island properties within the community of Sandbridge tend to be higher density, expensive, single-family homes, and/or multi-family seasonal rentals, especially along the ocean-front. Lands to the south are owned by the State Department of Conservation & Recreation and comprise False Cape State Park. Those State Park barrier island properties are primarily maintained in a primitive, natural state.

Most of the land within the expanded Refuge boundary is in a natural state. About 60% consists of fresh to slightly brackish emergent marsh and wooded swamps and bottomland forest. The remaining lands are old fields and agricultural fields.

Lands within and around the Refuge fall into several City Zoning categories. Zoning south of Sandbridge Road is primarily agricultural - preservation. A strip north of Sandbridge Road is zoned for commercial use; while the remainder is zoned for residential uses of various intensities. In the community of Sandbridge, zoning is residential. Sandbridge is the most densely settled area adjacent to the Refuge boundary. Much of Sandbridge is separated from Refuge lands to the immediate west by a series of man-made canals and natural

wetlands.

Most residential and commercial buildings consist of a wooden-frame, particle-board walls and shingle roofs. Many homes also include wooden decks that are, in some cases, adjacent to or contacting waxmyrtle shrubs, Loblolly pine trees and other natural vegetation. Fire (and smoke) threat in those areas is high, to both residences and natural habitats on Back Bay NWR. In some cases, prescribed burning will have to be conducted in relative proximity to some homes adjacent to the Refuge. Such prescribed burning must be conducted to both eliminate brush-piles from cleared fuel-breaks, and reduce fuel-loading or build-ups, on adjacent Refuge habitats. This habitat maintenance will greatly reduce the potential for wildfire spread into either the adjacent housing or into the Refuge from a structural fire. In the event of a wildfire with winds from the west, negative impacts to residences and businesses in Sandbridge, from smoke and/or fire, would be significant and could include structure losses. Businesses such as the Baja Restaurant, Sandbridge Market, two real estate offices, Sandbridge Rentals, etc. can be expected to lose customers if smoke impacts become serious. Therefore, prescribed fire in those areas must be carefully planned and remain within the Burn Plan prescription.

Despite the current generally rural nature of the area, the Refuge lies in the southeastern corner of one of the fastest growing metropolitan areas in the nation. Development in much of the Refuge acquisition boundary to the north and west of Back Bay has been curtailed by establishment of the "Green Line" conservation zone boundary, by short-term overlay zoning laws and by the Agricultural Reserve Program. However, the potential for large-scale, waterfront housing developments and large hotels exists, if these controls are removed by new City administrators.

While few systematic archeological surveys have been performed within Back Bay NWR, a number of prehistoric archeological sites exist within the present Refuge boundary. The probability of further sites within non-Refuge tracts is high, particularly along terrace edges that border wetlands. Documented historic settlement of the Ashville Bridge Creek and Nawney Creek areas dates from the second half of the 17th Century onward. Several plantations occupied the higher elevation "Pungo Ridge"along the western edge of the current Refuge boundary. In the early 18th Century, at least some of these had landings at the present wetlands edges, and subsidiary plantations on islands within the present Back Bay NWR. The probability of archeological, buried plantation remains is high within this area. The Refuge does not have any historical or archeological sites listed on the National Register of Historic Places, nor on the Virginia Landmarks Register.

E. SOCIAL/ECONOMIC

The City of Virginia Beach is one of the fastest growing coastal cities in the United States. Because of the high quality and diversity of its environmental resources, the City has long attracted residents and businesses. Its proximity to the naval and maritime facilities of Portsmouth, Norfolk and Newport News, together with the presence in the City of the Oceana Naval Air Station, Camp Pendleton Military Reservation, Little Creek Naval Amphibious Base, Fort Story Army Post, and other military installation, have made it an attractive location for military and civilian personnel and their families.

The City has undergone a period of rapid growth since its incorporation in 1962. From 1960 to 1980, the population of Virginia Beach increased from 85,218 to 262,199. The 1990 Census counted a population of 393,069, a ten-year increase of 50%. However, the population surrounding the Refuge has experienced only modest growth during the same time period.

In 1982, the City of Virginia Beach Planning Department reported a large percentage of white collar workers (36%), and followed by blue collar workers (22%), then military (18%), retired or unemployed (19%), and other workers (5%). Workers in the area are largely employed by the military, in retail and wholesale trades and services, in manufacturing, on the docks of Norfolk, Portsmouth and Newport News, in agriculture, and in higher education. Tourism and recreation-related industries make a significant contribution to the economy of Virginia Beach. During 1986, 2.5 million visitors generated over $431 million in City revenues.

With the exception of the community of Sandbridge, the local economy is primarily based on agriculture. Agricultural activities include farming for grain (corn, wheat, soybeans), melons and hog production. Sandbridge is a residential/recreational community of approximately 1,400 homes. During the summer, over one-half of the homes are occupied by non-resident property owners or short-term tenants. Sandbridge income is derived from rentals of these homes and from the sale of goods and services. Business activity in this area is currently expanding, including eco-tourism.

Because of its scenic ocean beaches, marshes and bays, and accessible recreational opportunities, the City of Virginia Beach continues to be a major summer tourist attraction. The beaches are the primary draw; however, the Back Bay area provides excellent opportunities for such wildlife-oriented recreational activities as fishing, bird-watching and other wildlife observation on foot or by canoe and bicycle, waterfowl hunting and photography.

V. ENVIRONMENTAL CONSEQUENCES

A. SOIL AND WATER RESOURCES

1. Alternative 1 - Wildland Fire Suppression Only

Under this alternative prescribed burning would not be permitted. Fire suppression actions would be implemented to combat wildfires when they occur. Fire suppression actions include: mobilization of heavy equipment and firefighting crews; fire control efforts including fire-line construction; mop-up; and other associated actions. Such actions can be more damaging to soils and sensitive habitats than the effects of the wildfire alone. Wildfires under this alternative tend to be the most intense and destructive. Such high intensity fires are more likely to occur under this alternative, due to heavier combustible fuel accumulations, that result from full fire suppression and no prescribed burning/fuel reduction. Maintaining good vegetative cover provides water quality benefits by reducing water runoff, soil erosion and associated sedimentation impacts. High intensity wildfires result in increased soil erosion and siltation impacts from destruction of soil-stabilizing vegetation and root mats below the soil surface. Under this alternative, soil erosion and water quality degradation would be the most severe. The water quality (turbidity, pH, dissolved oxygen, nutrient loading, etc.) of feeder creeks and waterways would be negatively impacted, and ultimately degrade the water quality of the North Bay portion of Back Bay.

2. Alternative 2 - Prescribed Fire and Wildland Fire Suppression

Implementation of prescribed fire in this alternative would minimize negative soil impacts, by controlling the area, timing, and intensity of fire. Some direct soil impacts would result from such preparation activities as fuel-breaks construction and clearing of access routes. However, negative soil impacts would be less than with Alternative 1; since heavy equipment, large firefighting crews and special suppression equipment would not be needed to such a degree. Wildfires under this alternative would be less intense and destructive than in Alternative 1, since fuel-loading would be reduced after a prescribed fire. Water quality impacts would also be reduced since the location, timing, and intensity of a prescribed burn are carefully controlled. Increased use of prescribed fire should, in the long term, reduce wildfire occurrence; since fuel loading is reduced. Thus, the soil and water quality impacts, of Alternative 1, would be greatly reduced, due to much less loss of plants and their root systems.

At times wildland marsh fires (often arson) spread onto the Refuge, or occur on-Refuge. However, because the affected habitats are almost always Black needlerush marshes, such erosive impacts are minimal; since needlerush rootstocks would be unaffected and

continue to hold soils in place.

B. VEGETATION AND FUELS

1. **Alternative 1 - Wildland Fire Suppression Only**
Using the "suppression alternative only" for all fires on Back Bay NWR, precludes prescribed fire use to retard vegetative succession and increase plant species diversity. Such prescribed fire use benefits native plant communities and associated wildlife. A decline in plant species diversity often coincides with an increase in undesirable, non-native vegetation. Wildfire suppression operations, including fireline construction and equipment transportation, often seriously damage or destroy sensitive plant communities. In addition, suppression of all wildfires allows the hazardous build-up of combustible, dead, finer fuels that directly contribute to hotter, larger wildfires and serious vegetation damage and mortality. The combination of reduced plant diversity, suppression equipment damage to sensitive plant communities/species, and sustained fine fuel build-ups, make this alternative a negative one.

2. **Alternative 2 - Prescribed Fire and Wildland Fire Suppression**
The most natural pattern of fire effects on vegetation and fuels, would occur under this alternative. Prescribed fire effects on vegetation and fuels would be generally beneficial. Under this alternative, certain areas would be selected for prescribed burning, to fulfill specific management and research goals for altering plant communities and reducing fuel build-ups. Prescribed fire on Back Bay NWR would principally occur for the following four purposes: 1) Removal of dead Phragmites stands and other undesirable plant covers (ie. *Spartina patens* and *Juncus roemerianus*); 2) Grasslands maintenance; 3) Moist-soil and marsh maintenance (preventing those areas from succeeding to shrubs and dense perennials); and 4) Reduction of natural fuel build-ups.

   Most prescribed burning for the above four purposes would occur during the fall or early winter. Occasional spring prescribed burns could also occur when necessary, for optional grasslands management practices. Increased plant diversity and reduced invasive and undesirable vegetation would result. Reduction of dead brush and dead-fall that shades the forest floor and retards germination of beneficial plants, would result. Reduced fuel build-ups would also occur and prevent or decrease the potential for large destructive wildfires. These impacts would generally be positive to the natural habitats burned.

   Suppression of local wildfires in emergent marsh habitats of Back Bay NWR will be handled less aggressively, where private property loss and public safety are not issues. This appears to have a beneficial impact to the marsh habitats and the wildlife that use them. The most common plant species in Back Bay's natural emergent marshes is Black

needlerush (*Juncus roemerianus*). This plant tolerates burning of the stem well, because of its extensive rhizomes. Removal of its sharp-tipped stems opens the marsh floor up to duck and shorebird use, while also providing wintering geese and Tundra swans with access to the rhizomes. Normally the rhizomes are not otherwise negatively impacted by fire, since they are buried within a wet, often mucky substrate. Local waterfowl hunters have historically burned off these needlerush marshes during late winter, to draw in flocks of Snow geese and other waterfowl for hunting. The fire history of Back Bay strongly implies that fire is a healthy part of Back Bay marsh ecology.

The impacts of tactical suppression operations against wildfire, particularly in wetlands and valuable edge-habitat areas, would be similar to those described under Alternative 1 of this "Vegetation and Fuels" section. These would continue to be generally negative.

C. WILDLIFE

1. **Alternative 1 - Wildland Fire Suppression**
   Wildlife populations could be influenced by the suppression of all fires on associated Refuge habitats and vegetation communities. Plant and animal species that rely on fire-dependent ecosystems could decline and be replaced by species more tolerant of conditions created when fire is removed as an ecological process. In addition, inadvertent destruction of wildlife habitats and disruption of resident wildlife populations could occur during wildfire suppression activities.

   However, even more significant are the destructive impacts generated by allowing vegetative fuel build-ups over the years, in the absence of any burning programs. Such a policy increases the potential for significant wildlife mortalities from an unsuppressable wildfire; since wildfire intensity, movement and size will be much greater in the presence of extensive fuel accumulations. Not only would the smaller, less mobile wildlife species (reptiles, amphibians, opossum, small mammals, insects, etc.) be lost, but many of the larger, more mobile wildlife species (Deer, raccoon, rabbit, etc.) could also be caught in such a hot, fast-moving fire, and greatly increase the wildlife mortality rate. This could result in a significant loss of wildlife individuals, and possibly entire populations, within the Refuge areas impacted. Such an impact would seriously disrupt the natural biological processes within the burned-over wildlife community.

2. **Alternative 2 - Prescribed Fire and Wildland Fire Suppression**
   The most natural impacts to Refuge habitats for the benefit of wildlife would occur under this alternative. Conditions favorable to fire-dependent wildlife species would be simulated, although not in the exact manner created by periodic, natural wildfire. The management of habitat types for the benefit of wildlife would be determined by

prescribed fire location, timing, environmental conditions, and patterns of burning. Management efforts could be adjusted to simulate natural fire effects to provide a more natural distribution of fire influenced habitats. Under this alternative, prescribed fire would be regulated to burn slowly and cooler, and thereby create much less of a threat to resident wildlife species; since smaller, less mobile species could escape underground, or underneath debris without being exposed to intense heat and suffocation.

Prescribed fire would be used to stimulate plant growth, set back succession, increase diversity, reduce nonnative plant species, and eliminate combustible fuels. Prescribed fire would be expected to reduce accumulation of light to moderate fuels while improving wildlife foraging capabilities, cover conditions, and nesting habitat for waterfowl, grassland breeding birds, and other wildlife. Fuels reduction alone would greatly reduce the opportunity for a disastrous wildfire with serious wildlife mortality.

As mentioned above, wildlife benefits are often realized from Black needlerush marsh fires in this area. Local residents have historically "burned off" their needlerush marshes to draw in high goose and duck use in the created openings. We suspect that these marshes have a fire history that dates back to pre-colonial times. The dense, tall-stemmed, sharp needlerush tips can pierce the skin, and greatly reduce waterfowl access to the marsh substrate. Removal of those stems increases waterfowl access to the exposed substrate, where rootstocks, vertebrates and invertebrates can be fed upon. Such "black marsh" attracts migrating and wintering waterfowl and migrating shorebird use. Increased periodic prescribed burning should be encouraged in these same areas, to reduce fuel-loading, while also providing waterfowl with additional feeding areas.

However, as with Alternative 1 above, wildfire suppression activities can result in the inadvertent damage or destruction of important wetlands and edge habitats important to wildlife and disrupt the biology of resident wildlife populations therein.

D. ENDANGERED AND THREATENED SPECIES

1. Alternative 1 - Wildland Fire Suppression

Under this alternative, some populations of sensitive flora and fauna (listed on Pages 13-16 of this EA) could be reduced or lost by: a) A total lack of fire; b) By an unnaturally high intensity wildfire; or c) By being shaded out by excessive vegetative fuel build-up. Endangered and threatened wildlife species would experience the same fate as explained above for resident wildlife for this alternative. The use of prescribed fire as a habitat maintenance tool to benefit endangered or threatened species, would not be possible under this alternative. Fuel reductions would not occur, and habitat quality and quantity would decline from excessive ground cover. Such changes could cause the loss of some

sensitive species, and the introduction of new, possibly undesirable species. In addition, should a non-suppressable, high-intensity wildfire occur, individual endangered and threatened species as well as their habitats, would be damaged or destroyed.

The suppression activities used to combat wildland fires would also pose a threat to the habitat quality and quantity, as well as individuals of these sensitive species.

2. Alternative 2 - Prescribed Fire and Wildland Fire Suppression

The scheduling of activities under this alternative provides a greater opportunity to plan for, locate, and avoid adverse impacts upon threatened and endangered species. Endangered and threatened species may or may not be favored by periodic, prescribed fire use, under this alternative. However, good prescribed fire planning would avoid negatively impacting these sensitive species. Some predator species (avian and mammal) benefit from fire; since the post-fire removal of vegetative cover would exposes prey species to their view. Although this would be a short-term benefit, from which the prey species would quickly recover, as the vegetative cover resprouts.

Fuel reductions would occur, and habitat quality and quantity would benefit from reduced litter and other ground covers. Such changes could result in an increase in some sensitive species, more diverse habitat mixes, and sustain habitat quality and quantity to support existing endangered and threatened species. Other beneficial actions for threatened and endangered species could also be accommodated under this alternative.

Wildland fire would be suppressed in habitats where fire-sensitive endangered or threatened species could be negatively impacted, and in areas where other critical resources exist. Suppression impacts for any wildland fire would be similar to those described under Alternative 1 for this Section (D) and for Alternatives 1 and 2 of "Section C - Wildlife."

E. CULTURAL RESOURCES

1. Alternative 1 - Wildland Fire Suppression

Known cultural resources would receive protection from wildfire under this alternative. Cultural resources susceptible to damage by fire could be lost or damaged by high intensity wildland fires beyond the ability of suppression forces to control. High-intensity fires are more likely to occur under this alternative due to the accumulation of combustible fuels resulting from total fire suppression. Wildfires under this alternative tend to be the most intense and destructive. Loss of private properties, including homes and businesses, in the adjacent Town of Sandbridge along the eastern boundary of the Refuge, are most likely under this alternative. Loss of unknown cultural resources would

also be likely with a high-intensity wildfire.

Under this alternative there would be increased potential for damage to previously unrecorded cultural resources as a result of fire suppression activities (ie. heavy equipment and firefighter tools use).

2. **Alternative 2 - Prescribed Fire and Wildland Fire Suppression**
The scheduled nature of periodic prescribed fire under this alternative provides the ability to access, locate, and consequently avoid disturbance to cultural resources. Use of prescribed fire requires the establishment of fuel/fire breaks between natural areas on the Refuge and adjacent private properties located in the Community of Sandbridge and along public roadways, together with other cultural resources. These breaks could be created mechanically or by prescribed fire. Known cultural resources should be protected by fire/fuel breaks or other means. The use of prescribed fire to reduce fuel accumulations should also protect unrecorded cultural resources from the effects of wildland fires.

Wildland fire suppression impacts threatening cultural resources could be similar to Alternative 1; however, such impacts should be less severe with fuel-breaks already in place. These breaks should not only protect nearby cultural resources, but also provide access for fire suppression equipment and personnel. The potential negative impacts of wildland fire suppression equipment and activities would be similar to those of Alternative 1, above.

F. VISUAL/AESTHETICS/AIRSHED

1. **Alternative 1 - Wildland Fire Suppression**
Under this alternative infrequent high intensity wildfires are more probable and could result in considerable changes in the appearance of affected areas before suppression. Entire habitats could be lost and the landscape severely modified and scarred. Unsightly and potentially long lasting scars in the earth/substrate, from tactical suppression equipment and operations could result. Under this alternative there would be a short-term reduction in the generation of particulate emissions from fires because of control actions. However, there is the potential for severe air pollution from a large, uncontrollable wildfire that becomes likely as time passes, and fuels accumulate.

2. **Alternative 2 - Prescribed Fire and Wildland Fire Suppression**
The use of periodic prescribed fire provides the short-term negative impact of more frequent, but lighter, smoke production. With the accompanying reduced fuel-loading and fire intensity, such impacts should be less than that of a high-intensity wildlands fire

in the same habitat. Areas with sensitive visual resources (ie. homes in Sandbridge) could be protected from fire and smoke, and from some wildland fire suppression activities under this alternative. Some visual changes would occur. However, lower intensity prescribed fires usually result in minimal scarring to the landscape, quick habitat recovery and good smoke dissipation.

Most local wildland fires occur in remote needlerush marshes that are surrounded by natural fire barriers (water, fuel breaks, or paved roads), within the Back Bay vicinity. Such fires would receive the least aggressive suppression action; when no threat to sensitive man-made or natural resources exists, and where the fire can be monitored by fire personnel. Historically the impacts of such wildlands fire use provide minimal impacts to local residents and other sensitive resources.

This Alternative provides a higher degree of positive air quality management; since it encourages the scheduling of prescribed burns only during weather that provides minimal smoke impacts to roadways and surrounding human residential areas. Short-term smoke episodes could still occur under this alternative, but fuel reduction would greatly reduce episodes of severe air pollution due to large, uncontrolled wildfires.

G. VISITOR/PUBLIC USE AND SAFETY

1. **Alternative 1 - Wildland Fire Suppression**
   This alternative would result in minimal visitor impacts. However, visitor interpretation of the refuge would be influenced by the unnaturally dense vegetation, deadfall, and ground litter, that occur in unburned refuge habitats. Should a wildlands fire occur, some areas could be closed to the public, because of dense fuel accumulations and the higher probability of a severe wildfire.

   Wildland fire suppression is hazardous by nature. The inherent safety risks associated with small fires are compounded on larger, high-intensity wildfires; for both the firefighters and the visiting public. Hazards include direct flame exposure, respiratory problems associated with smoke inhalation, and the use of mechanized heavy equipment during periods of poor visibility. This alternative would pose the greatest hazard to the safety of Refuge staff, firefighters and the visiting general public.

2. **Alternative 2 - Prescribed Fire and Wildland Fire Suppression**
   This alternative would entail some disruptions to Refuge programs and visitor use. Operational activities associated with prescribed burns could limit visitor use and access to portions of the refuge (ie. impoundments complex). Smoke production could detract from visual enjoyment and restrict access on roads and trails. However, activities

associated with prescribed fire are accomplished in a safe manner through preplanning and scheduling of work tasks outside of high visitor use periods. Ignition is predetermined and designed to control fire intensity, and rate of spread.

The prescribed fire use of this alternative provides the most ideal, natural habitats for Refuge visitors to enjoy. Initial safety hazards are lower under this alternative than under Alternative 1 because of reduced fuel-loading, and a reduction in the probability of direct exposure to severe fire effects. Adequate fire management personnel and equipment could be present during prescribed fire events for the protection of life and property. If necessary, fire staff from Great Dismal Swamp NWR or other northeast refuges can be provided to assist.

Due to a lack of control in the location, timing, and intensity, Refuge visitors and neighbors could be inconvenienced during a wildlands fire outbreak. If the wildfire threatens visitor safety, suppression actions would have to be taken. The hazards associated with wildland fire suppression are similar to, but not as severe, as those listed in Alternative 1. Since, a diminished threat to human safety would correlate with the reduced fuel-loading resulting from consistent prescribed burning efforts on Refuge lands.

H. ECONOMIC

1. **Alternative 1 - Wildland Fire Suppression**
   Immediate suppression of potentially damaging wildfires would reduce the short term potential losses to high value capital improvements, both on and off the Refuge. However, the suppression program could become costly; since fuel-reduction and/or firefighting costs of the suppression program steadily increase with fuel accumulations. High-intensity fires are often costly to suppress.

   The loss of adjacent private properties (housing and businesses) to a high-intensity wildlands fire could cause severe local economic damage; while the loss of Refuge natural resources, capital improvements, visitor access opportunities, and visitor experiences would negatively impact Back Bay Refuge operations. In addition, the cost of correcting damage to Refuge and adjacent private lands during wildlands fire suppression actions would increase the overall costs of this Alternative.

2. **Alternative 2 - Prescribed Fire and Wildland Fire Suppression**
   Reduction of hazardous fuels in the vicinity of structures and other capital improvements would reduce potential economic losses from a catastrophic fire. The mechanical clearing of fuel/fire breaks coupled with prescribed burning, would minimize the risk of

wildland fires impacting critical resources they are designed to protect. Good preplanning and adhering to the environmental conditions of the approved prescription will result in a safe, low-cost prescribed burn. Prescribed burning can be a cost-effective alternative to other land management techniques, including mechanical.

Continued prescribed burning programs will reduce fuel-loading of Refuge habitats and thereby reduce the fire threat to adjacent private lands. Such reduced fuel-loading will in turn reduce the frequency, duration and intensity of a wildland fire, should it occur; making it more suppressable. However, repair costs to Refuge and adjacent private lands during wildlands fire suppression activities, in areas that can be accessed, continue to make this option expensive; although not as costly as Alternative 1 during a high-intensity fire.

I. OVERALL PROGRAM RISK

1. Alternative 1 - Wildland Fire Suppression

In the short term, this alternative appears to provide the greatest protection from fire. However, in the long term, this alternative jeopardizes natural resources, including terrestrial ecosystems on the refuge that may be dependent on fire; while also creating unnatural fuel-loading conditions that lead to greater potential for a catastrophic, high-intensity wildland fire, with associated wildlife resource and property losses.

Actions aimed at suppressing all wildlands fires would result in some heavy equipment damage to Refuge habitats and possibly to Refuge wildlife. These hazards make this the least desirable alternative.

2. Alternative 2 - Prescribed Fire and Wildland Fire Suppression - The Proposed Action

Alternative 2 presents reduced risks to refuge resources because prescribed fires are controlled and planned operations, carried out under a prescribed set of conditions, conducted by trained fire management specialists. Under this preferred alternative, prescribed fire may be used to combat non-native, invasive vegetation, and support fire-dependent native vegetation, for the benefit of Refuge wildlife and their habitats.

In areas where wildland urban interfaces exist, such as the Town of Sandbridge, fuel/fire-breaks must be maintained, to provide an adequate, fuel-free buffer between adjacent housing and Refuge wildlands. Once the Sandbridge Wildland-Urban Interface fuel-break is completed, the potential for dangerous wildland fires impacting the Town of Sandbridge will be greatly reduced. Prescribed burning of Refuge shrub-scrub habitats to the west can then be undertaken to reduce the heavy fuel loads present there.

Back Bay NWR will take the least aggressive suppression action in areas where no threat exists to adjacent private property and/or public safety; where the fire cannot be reached with firefighting equipment/personnel; where the fire will burn to natural fuel-breaks; and where it can be monitored by firefighting personnel. Examples of such areas include: Refuge black needlerush marshes on Back Bay islands; needlerush marshes along the Back Bay shoreline; and needlerush marshes along Refuge waterways. Such a wetlands wildfire removes dead Black needlerush fuel-loading; clears away live, sharp-tipped needlerush stems for waterfowl feeding during the winter, spring and fall; and generally benefits other local wildlife resources. Contact with the Sandbridge Fire Department will be maintained, and observers (with communication to the Refuge Prescribed Fire Burn Boss) will be stationed at the scene to monitor fire spread and behavior, and insure that no sensitive resources are threatened.

All unplanned wildland fires that threaten private property, critical wildlife resources, Refuge structures, and other important Refuge sensitive resources will be suppressed. These suppression actions may negatively impact sensitive habitats. However, such negative impacts should be less than for Alternative 1; since fuel-reduction and other prescribed-burning benefits should reduce the frequency and severity of Refuge wildland fires; which would require less equipment and related negative habitat impacts. This is the preferred alternative.

VI. POTENTIAL IMPACT MITIGATING MEASURES FOR THE PROPOSED ACTION

The following steps will be taken to mitigate the impacts of prescribed fire use on sensitive areas:

A. Smoke sensitive areas will be identified and addressed within the Annual Prescribed Fire Burn Plan. The desirable wind direction selected will insure that smoke and other particulate emissions are transported away from neighboring residences, businesses and other sensitive areas in the fire vicinity.

B. Burning will be conducted only when visibility exceeds four miles and when the fire weather forecasts indicate the presence of: 1) An unstable airmass; 2) Mixing heights of greater than 1500 feet; 3) Ventilation rates (mixing heights X transport wind speed) of 3000 or greater; and 4) A minimum surface wind speed of 2 mph.

C. No burning will occur if a federal or State government agency issues an air pollution health advisory, alert, warning, or emergency for the area surrounding Back Bay NWR.

D. Backing and flanking fires will be used when possible to minimize particulate emissions.

Endemic species distribution information will be reviewed when evaluating resources at risk to reduce impacts from fire management activities.

Available inventories and information concerning cultural resources will be consulted prior to implementing prescribed fire management activities.

VII. CONSULTATION AND COORDINATION WITH OTHERS

The intent of the FMP at Back Bay NWR is to protect and enhance natural resources in support of refuge management goals and objectives. Endangered Species Act, Section 7 consultation procedures and smoke management guidelines will be followed. Maintaining a good working relationship with all involved state and federal agencies, neighboring townships, local fire department, and the public, is essential to the success of the fire management program.

This Environmental Assessment will be sent to local, state, and federal agencies, and to individuals or groups with an interest in fire management at Back Bay NWR. A legal notice announcing the availability of the Draft Environmental Assessment for public review and comment will be placed in the local newspaper, "The Virginian-Pilot." This document will also be made available at the Back Bay Refuge headquarters.

VIII. SUMMARY

There are major differences between the two alternatives proposed in this document. These alternatives were developed in an effort to find a suitable method for accomplishing the objectives of the Back Bay NWR, as described in the "Purpose and Needs" section of this document, and in Section III of the new Refuge 2002 Fire Management Plan. In summary, these objectives were designed to manage prescribed fire management actions and related prescribed burning, to efficiently accomplish natural resource management on Back Bay NWR.

These objectives include: 1) Protect life and property; 2) Perpetuate the migratory bird resource; 3) Preserve native wetland biotic communities in their natural states; 4) Maintain maximum habitat diversity for the benefit of wildlife; 5) Protect, restore, and maintain endangered and

threatened species and their habitats; 6) Implement a safe and cost-effective program of resource protection and enhancement; and 7) Reduce hazardous fuels.

The alternatives detailed in this document will accomplish these objectives to varying degrees. The implications of each proposed alternative are summarized below.

A. ALTERNATIVE 1 - WILDLAND FIRE SUPPRESSION

This alternative entails the suppression of all ignitions regardless of cause. No prescribed fire would be initiated. Increased fire suppression actions would negatively impact Refuge habitats most under this alternative; while wildland fires would be severe.

B. ALTERNATIVE 2 - PRESCRIBED FIRE AND WILDLAND FIRE SUPPRESSION

This alternative enables the refuge to use prescribed fire in predetermined areas, within preplanned conditions, to accomplish specific resource management objectives. Under this alternative, fire hazards adjacent to residential neighborhoods (ie. The community of Sandbridge) and scattered single-family homes, would be reduced via prescribed burning programs (mechanical clearing, and with fire). Other areas where prescribed burning would be considered include remote, uninhabited, interior black needlerush wetlands. Less aggressive wildland fire suppression actions will be taken in such wetlands areas, where no threats exist; where fire will burn out at natural fuel-breaks; where fire cannot be reached; and where fire can be monitored by fire-fighting personnel. Prescribed burning would only be considered under the right conditions.

A "No-Action Alternative," of allowing all fires to burn at all times, was initially considered, but dismissed as not suitable for further consideration in the development of this proposal. This "No-action Alternative" was rejected because it failed to meet U.S. Fish and Wildlife Service policies governing public safety, potential liability for loss of life and property, and unacceptable environmental, social, and economic costs.

IX. LITERATURE CITED

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U.S. Department of Agriculture, Soil Conservation Service in Cooperation with Virginia Polytechnic Institute & State University. **Soil Survey of City of Virginia Beach, Virginia**. September 1985.

APPENDIX A

Virginia State-listed Threatened and Endangered species likely to occur on Back Bay NWR include the following:

BIRDS

Endangered	Threatened
Peregrine Falcon	Bald Eagle
American Bittern	Gull-billed Tern
Least Bittern	Henslow's Sparrow
Black Tern	Loggerhead Shrike
	Piping Plover
	Upland Sandpiper

FISH

Endangered	Threatened
Shortnose Sturgeon	Carolina Darter

REPTILES

Endangered	Threatened
Atlantic Green Sea Turtle	Loggerhead Sea Turtle
Hawksbill Sea Turtle	Eastern Glass Lizard
Kemp;s Ridley Sea Turtle	
Bog Turtle	
Eastern Chicken Turtle	

MAMMALS

Endangered
Eastern Big-eared Bat
Water Shrew

INVERTEBRATES

Threatened
Duke's Skipper

PLANTS

Endangered	Threatened
Epiphytic Sedge	Carolina Liliaeopsis